



Study on the association of Chronic Obstructive Pulmonary Disease and the use of cooking fuel among adults in a rural area of Kamrup District, Assam.

KEYWORDS

Chronic Obstructive Pulmonary Disease, Cross sectional study, Spirometry, Biomass Fuel

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ABSTRACT *Background:* Chronic Respiratory Disease includes asthma and chronic obstructive pulmonary disease (COPD). India contributes a significant and growing percentage of COPD mortality. *Aim:* to study the association of Chronic Obstructive Pulmonary Disease (COPD) and the use of cooking fuel among adults in a rural area of Kamrup District, Assam. *Setting and Design:* Cross sectional study was conducted among 600 adults of more than 40 years residing in sampled villages of Boko-Bongaon Block. *Materials and method:* Respondents were interviewed using pretested and semi structured schedule and then spirometry was performed. *Results:* Out of 328 adults, who did not use to self-cook, 3.05% had COPD; out of 110 adults who used to cook with LPG & Kerosene, 5.45% had COPD. *Conclusion:* Persons who had potential etiological exposures with biomass fuel smoke should be asked to take necessary measures to prevent themselves from such potential exposure.

Introduction:

Chronic respiratory disease (CRD) is one of the most common causes of disease burden globally and in India. CRD includes asthma and chronic obstructive pulmonary disease (COPD) which together may account for an estimated burden of about 100 million individuals in India.¹ Chronic obstructive pulmonary disease (COPD), a common preventable and treatable disease, is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles and gases. Exacerbations and comorbidities contribute to the overall severity in the individual patients.² Most of the information available on COPD prevalence, morbidity and mortality comes from high-income countries. Even in those countries, accurate epidemiologic data on COPD are difficult and expensive to collect. However, it is known that low- and middle-income countries already shoulder much of the burden of COPD with almost 90% of COPD deaths taking place in these countries.^{3,4} India contributes a significant and growing percentage of COPD mortality which is estimated to be amongst the highest in the world. This study was conducted with the aim to study the association of Chronic Obstructive Pulmonary Disease (COPD) and the use of cooking fuel among adults in a rural area of Kamrup District, Assam.

Materials and methods:

The study was a community based cross-sectional study. It was conducted in the sampled villages of Boko-Bongaon Block, which was the field practice area of Rural Health and Training Centre under Department of Community Medicine, Gauhati Medical College, Guwahati, Assam.. Adults of more than 40 years of age who gave consent to participate in the study were included in the study. Patients with known pulmonary tuberculosis, malignancy or acutely ill patients were excluded from the study. Patients with conditions that may be aggravated by forced expiration e. g, current pneumothorax, recent ophthalmic, thoracic, abdominal or neurosurgery were also excluded from the study population. Using the prevalence of COPD above 40 years of age group as 7.1% (Mahesh PA et al. 2009)⁵, absolute error as 3%, the sample size was calculated to be around 293, using the formula, $n = Z^2pq/L^2$ Where, n = the required sample size, z = 2, p = expected or assumed prevalence, q = (100-p) and L = precision. Cluster Sampling was applied as the sampling design; hence with a design effect as 2 the sample size was then calculated as 586. It was rounded off to 600. The 140 villages (Census 2011) under the Boko-Bongaon Block were taken as the primary sampling unit. Thirty clusters were selected by using

Probability Proportional to Size (PPS) method and 20 adults were taken from each cluster to get the desired sample size of 600. House to house visit was done until the desired 20 adults above 40 years of age are found in each cluster. If the required sample was not obtained in one cluster then the adjacent village was included to get the desired sample. In each selected household, all the adults meeting the inclusion criteria were included in the study. The study was conducted from August 2015 to July 2016 for a period of 1 year.

The interviews were conducted by house to house visit in the selected villages. They were carefully briefed prior to the commencement of field work regarding purpose of the study. Then the respondents were interviewed using pretested and semi structured schedule and then spirometry was performed. Before commencing the field work, necessary approval for conducting the study by the Institutional Ethics Committee (IEC) of Gauhati Medical College & Hospitals has been obtained.

COPD was diagnosed based on Global initiative for chronic obstructive pulmonary disease (GOLD) guideline.⁶ Exposure to cooking fuel combustion was considered positive if the individual gave the history of regularly cooking at home. The types of cooking fuels used at home included liquefied petroleum gas (LPG), kerosene, or the solid fuels i.e. dried wood, dung and other products of animal or plant origin (biomass fuels).⁷

Data collected was entered in Microsoft Office Excel and analyzed by using INSTAT GRAPH PAD. Criteria of significance used in the study was $p < 0.05$.

Results:

Table 1 shows that majority (44.17%) belonged to 41-50 years age group, 27.83% belonged to 51-60 years age group, 17.67% belonged to 61-70 years age group whereas only 10.33% belonged to above 70 years of age. Among all the 600 adults, 256(42.67%) were male and 344(57.33%) were female. A total of 459(76.5%) were Hindu, 126(21%) were Muslims and 15(2.5%) were Christian by religion. Out of those 600 adults, 216(36%) were illiterate, 152(25.33%) studied up to primary level, 98(16.33%) studied till middle school, 82(13.67%) were High School Leaving Certificate (HSLC) passed and 52(8.67%) were HS (higher secondary) passed and above. According to modified B.G. Prasad Classification (January, 2014) maximum nos. 194(32.33%) belonged to Class II, 156(26%) belonged to Class V, 116(19.33%) belonged to Class IV, 76(12.67%) belonged to Class III and only

58(9.67%) belonged to class I Socio-economic class.

Table 1: Distribution of respondents based on socio-demographic profile:

Class	Frequency (Percentage)	
Age group(in years)	41-50	265(44.17%)
	51-60	167(27.83%)
	61-70	106(17.67%)
	>70	62(10.33%)
Sex	Male	256(42.67%)
	Female	344(57.33%)
Religion	Hindu	459(76.5%)
	Muslim	126(21%)
	Christian	15(2.5%)
Educational status	Illiterate	216(36%)
	Primary school	152(25.33%)
	Middle school	98(16.33%)
	HSLC passed	82(13.67%)
	HS passed and above	52(8.67%)
Socio-economic status*	Class I	58(9.67%)
	Class II	194(32.33%)
	Class III	76(12.67%)
	Class IV	116(19.33%)
	Class V	156(26%)

Table 3: Distribution of adults according to COPD prevalence in different types of cooking fuel used:

Types of Cooking Fuel	Chronic Obstructive Pulmonary Disease		Total
	Present (Percentage)	Absent (Percentage)	
No Self Cooking	10(3.05)	318(96.95)	328
Cooking with LPG & Kerosene	6(5.45)	104(94.55)	110
Cooking with Solid Fuel	21(12.96)	141(87.04)	162
Total	37(6.17)	563(93.83)	600

$\chi^2 = 18.538$ $df = 2$ $p < 0.05$
 N.B. Figure in bracket shows row wise percentage.

Table 4 shows that out of 10 COPD cases who did not use to self-cook, maximum nos. 5(50%) had Grade I COPD; out of 6 COPD cases who used to cook using LPG & Kerosene, maximum nos.4(66.68%) had Grade II COPD. Out of 21 COPD cases who used to cook using solid fuel, maximum nos. 9(42.86%) had Grade II COPD.

Table 4: Distribution of COPD cases according to COPD severity (GOLD grading) in different types of cooking fuel used:

Types of Cooking Fuel	Chronic Obstructive Pulmonary Disease(Grade)				Total
	GrI (%)	GrII (%)	GrIII (%)	GrIV (%)	
No Self Cooking	5 (50)	2 (20)	2 (20)	1 (10)	10
Cooking with LPG & Kerosene	1 (16.66)	4 (66.68)	1 (16.66)	0	6
Cooking with Solid Fuel	4 (19.05)	9 (42.86)	6 (28.57)	2 (9.52)	21
Total	10 (27.03)	15 (40.54)	9 (24.32)	3 (8.11)	37

N.B. Figure in bracket shows row wise percentage.

Discussion:

The present study was conducted with the aim to study the association of Chronic Obstructive Pulmonary Disease (COPD) and the use of cooking fuel among adults in a rural area of Kamrup District, Assam. In this present study majority 328(54.67%) of the adults did not have the habit of self-cooking, 162(27%) used solid fuel during cooking, 86(14.33%) used LPG whereas only 24(4%) adults

used kerosene as cooking fuel. In a study conducted by Debabrata Das⁸ in Assam, a total number of 600 respondents spread across 40 Gram Panchayat of Nagaon district were studied. All the respondents belong to the Below Poverty Line (BPL) category. It is found that majority (87 percent) of the respondents exclusively used firewood, crop residue and dung for cooking; and the remaining 13 percent used kerosene, LPG and electricity. Interestingly, the use of dung is very negligible in Assam.

In the present study out of 328 adults who did not use to self-cook, 10(3.05%) had COPD; out of 110 adults who used to cook with LPG & Kerosene, 6(5.45%) had COPD; out of 162 adults who used to cook using solid fuel, 21(12.96%) had COPD. In a similar study conducted by Kurmi OP et al.⁹ found the prevalence of airflow limitation to be almost double in residents of households using biomass fuel compared to households using liquefied petroleum gas (LPG) (8.1 vs. 3.6%).

In this present study out of 10 COPD cases who did not use to self-cook, maximum nos. 5(50%) had Grade I COPD; out of 6 COPD cases who used to cook using LPG & Kerosene, maximum nos.4(66.68%) had Grade II COPD but no cases of Grade IV COPD was seen. Out of 21 COPD cases who used to cook using solid fuel, maximum nos. 9(42.86%) had Grade II COPD. So our study clearly states that more number of Grade II and III cases was found among solid fuel users compared to LPG and Kerosene users. Similarly in a study¹⁰ among adult rural and urban Nepalese populations Dyspnea (mMRC \geq Grade 2) and wheezing (ever or on most days/nights) were more common among biomass users compared to those who used non-biomass fuel ($p < 0.001$) that means the biomass fuel users contain more severe cases.

Conclusion:

In this present study majority of the adults did not have the habit of self-cooking, 27% used solid fuel (dried wood, dung and other products of plant origin) during cooking. The present study states that the adults who used to cook using solid fuel had higher prevalence of COPD compared to LPG and Kerosene users. In our study more number of Grade II and III cases was found among solid fuel users compared to LPG and Kerosene users. Those persons in the community who had potential etiological exposures with biomass fuel smoke should be asked to take necessary measures to prevent themselves from such potential exposure. Further research is required to know more about the influence of various socio demographic factor and other risk factors on COPD in the study area.

Limitation:

The spectrum of the present study is quite vast. The study area was located in rural Kamrup District 85 km away from Gauhati Medical College and with limited time duration, therefore it was not possible to cover all the desired parameters and get the results in minute details to the extent of highest level of desire. Although sincere efforts were made to cover all desired parameters and to derive the best results out of it as far as possible

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